CLAIMS

What is claimed is:

1. A metallic barrier for separating fuel gas from oxidant gas, comprising:

a metallic plate having first and second surfaces, the fuel gas being exposed to the first surface and the oxidant gas being exposed to the second surface;

an adherent oxide layer formed on the second surface at a metal-metal oxide interface; and

a portion of the fuel gas diffusing into the metallic plate from the first surface, the portion of fuel gas modifying an oxidation environment at the metal-metal oxide interface to dynamically stabilize a thickness of the adherent oxide layer.

2. The metallic barrier of claim 1, wherein a diffusion path length between the first and second surfaces is selected such that the portion of fuel gas reaches the metal-metal oxide interface.

3. The metallic barrier of claim 1, wherein at least one refractory particle extends through the thickness of the stabilized oxide layer.

4. The metallic barrier of claim 3, wherein the refractory particle is electronically conductive, such that a continuous electronically conductive path is formed between the first and second surfaces.

5. The metallic barrier of claim 4, wherein the electronically conductive refractory particle is doped lanthanum chromite.

6. The metallic barrier of claim 3, wherein the refractory particle reduces a diffusion area of the stabilized oxide layer.

7. The metallic barrier of claim 6, wherein the refractory particle has lower diffusivity than the oxide layer so as to reduce the total diffusion.

8. A fuel cell bipolar separator, comprising:

a metallic plate having first and second surfaces, the fuel gas being exposed to the first surface and the oxidant gas being exposed to the second surface;

a porous layer of electronically conductive refractory particles in electrical contact with the second surface;

an adherent oxide layer formed on the second surface between the refractory particles, the refractory particles constituting electronically conductive paths through the adherent oxide layer to the metallic plate; and

a portion of the fuel gas diffusing into the metallic plate from the first surface, the portion of fuel gas modifying an oxidation environment at the metal-metal oxide interface to dynamically stabilize a thickness of the adherent oxide layer.

9. The fuel cell bipolar separator of claim 8, further including a substrate for receiving the porous layer.

10. The fuel cell bipolar separator of claim 9, wherein the electronically conductive refractory particles of the porous layer are applied to the substrate by a thermal spraying process.

11. The fuel cell bipolar separator of claim 8, wherein the electronically conductive refractory particles are composed of doped lanthanum chromite.

12. The fuel cell bipolar separator of claim 8, wherein the metallic plate is formed by spraying dense metal over the porous layer.

13. The fuel cell bipolar separator of claim 8, wherein the metallic plate is applied by a thin film deposition process.

14. The fuel cell bipolar separator of claim 8, wherein the metallic plate is a metal foil.

15. A seal incorporating a metallic barrier, the seal being positioned between first and second members and exposed to fuel gas on one side of the metallic barrier and oxidant gas on the other side of the metallic barrier, comprising:

a hollow metallic structure having at least an open side, a closed side, and an interior, the interior being fluidly connected to the fuel gas;

a metallic plate formed as part of the hollow metallic structure, the metallic plate having first and second surfaces, where the first surface is exposed to the fuel gas through the interior of the hollow metallic structure and the second surface is exposed to the oxidant gas;

an adherent oxide layer formed on the second surface at a metal-metal oxide interface; and

a portion of the fuel gas diffusing into the metallic plate from the first surface, the portion of fuel gas modifying an oxidation environment at the metal-metal oxide interface to dynamically stabilize a thickness of the adherent oxide layer.

16. The seal of claim 15, wherein an interior of the hollow metallic structure is filled by a porous structure.

17. The seal of claim 16, wherein the porous structure is a ductile metal.

18. The seal of claim 16, wherein the porous structure is a ceramic powder.

19. The seal of claim 15, wherein the hollow metallic structure is self-supporting.

20. A method for separating fuel gas from oxidant gas using a metallic barrier, comprising the steps of:

providing a metallic plate having first and second surfaces;

exposing the fuel gas to the first surface of the metallic plate;

exposing the oxidant gas to the second surface of the metallic plate;

forming an adherent oxide layer on the second surface at a metal-metal oxide interface; and

diffusing a portion of the fuel gas from the first surface into the metallic plate for modifying an oxidation environment at the metal-metal oxide interface to dynamically stabilize a thickness of the adherent oxide layer.

21. The method of claim 20, wherein the fuel gas is hydrogen.

22. The method of claim 20, wherein the metallic substance is selected from the group consisting of: nickel, copper and cobalt.